

CLAIMS

- 1 1. A calibration method handling occurrences of thermometer code bubbles in an
2 A/D sub-converter in an A/D converter stage, including the steps of:
3 - detecting two A/D sub-converter comparators causing a bubble;
4 - increasing the threshold of the bubble causing comparator having the lowest
5 threshold by a first predetermined voltage; and
6 - decreasing the threshold of the bubble causing comparator having the
7 highest threshold by a second predetermined voltage.
- 1 2. The method of claim 1, wherein said first and second voltages are fractions of
2 the A/D sub-converter quantization step.
- 1 3. The method of claim 2, wherein said first voltage is equal to said second
2 voltage.
- 1 4. The method of claim 1, including the steps of:
2 - determining the last A/D sub-converter comparator having a threshold that is
3 smaller than an analog A/D sub-converter input signal;
4 - increasing the threshold of said determined comparator by a third
5 predetermined voltage if a residual signal from said A/D converter stage falls below a
6 predetermined minimum level; and
7 - decreasing the threshold of the first A/D sub-converter comparator having a
8 threshold that is larger than said analog A/D sub-converter input signal by a fourth
9 predetermined voltage if said residual signal exceeds a predetermined maximum level.
- 1 5. The method of claim 4, wherein said third and fourth voltages are fractions of
2 the A/D sub-converter quantization step.
- 1 6. The method of claim 5, wherein said third voltage is equal to said fourth
2 voltage.

- 1 7. The method of any of the preceding claims, wherein said thresholds are
- 2 modified by modifying comparator offsets.

- 1 8. A calibration apparatus handling occurrences of thermometer code bubbles in
2 an A/D sub-converter in an A/D converter stage, comprising:
3 - means for detecting two A/D sub-converter comparators causing a bubble;
4 - means for increasing the threshold of the bubble causing comparator having
5 the lowest threshold by a first predetermined voltage; and
6 - means for decreasing the threshold of the bubble causing comparator having
7 the highest threshold by a second predetermined voltage.
- 1 9. The apparatus of claim 8, further comprising:
2 - means for determining the last A/D sub-converter comparator having a
3 threshold that is smaller than an analog A/D sub-converter input signal;
4 - means for increasing the threshold of said determined comparator by a third
5 predetermined voltage if a residual signal from said A/D converter stage falls below a
6 predetermined minimum level; and
7 - means for decreasing the threshold of the first A/D sub-converter comparator
8 having a threshold that is larger than said analog A/D sub-converter input signal by a
9 fourth predetermined voltage if said residual signal exceeds a predetermined
10 maximum level.
- 1 10. The apparatus of claim 8, further comprising means for modifying said
2 thresholds by modifying comparator offsets.

1 11. A multi-stage A/D converter including a calibration apparatus handling
2 occurrences of thermometer code bubbles in an A/D sub-converter in at least one A/D
3 converter stage, said calibration apparatus comprising:

- 4 - means for detecting two A/D sub-converter comparators causing a bubble;
- 5 - means for increasing the threshold of the bubble causing comparator having
6 the lowest threshold by a first predetermined voltage; and
- 7 - means for decreasing the threshold of the bubble causing comparator having
8 the highest threshold by a second predetermined voltage.

1 12. The multi-stage A/D converter of claim 11, said calibration apparatus
2 comprising:

- 3 - means for determining the last A/D sub-converter comparator having a
4 threshold that is smaller than an analog A/D sub-converter input signal;
- 5 - means for increasing the threshold of said determined. comparator by a third
6 predetermined voltage if a residual signal from said A/D converter stage falls below a
7 predetermined minimum level; and
- 8 - means for decreasing the threshold of the first A/D sub-converter comparator
9 having a threshold that is larger than said analog A/D sub-converter input signal by a
10 fourth predetermined voltage if said residual signal exceeds a predetermined
11 maximum level.

1 13. The multi-stage A/D converter of claim 11, further comprising means for
2 modifying said thresholds by modifying comparator offsets.

- 1 14. A flash A/D converter handling occurrences of thermometer code bubbles,
2 comprising:
- 3 - means for detecting two A/D converter comparators causing a bubble;
 - 4 - means for increasing the threshold of the bubble causing comparator having
5 the lowest threshold by a first predetermined voltage; and
 - 6 - means for decreasing the threshold of the bubble causing comparator having
7 the highest threshold by a second predetermined voltage.
- 1 15. The flash A/D converter of claim 14, further comprising means for modifying
2 said thresholds by modifying comparator offsets.